

IN THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

1.-24. (cancelled)

25. (New) A haptic information presentation method comprising:

generating a physical quantity comprising at least one of a vibration, a torque and a force;

presenting a sensory quantity to a human body to be perceived by said human body, said sensory quantity comprising at least one of a vibration sensation, a torque sensation and a force sensation; and

controlling said physical quantity comprising at least one of said vibration, said torque and said force,

wherein said controlling comprises controlling said physical quantity based on a haptic sensory characteristic of a human body, wherein said haptic sensory characteristic represents a relationship between said physical quantity to be applied to a human body and said sensory quantity to be perceived by a human body.

26. (New) A haptic information presentation system, comprising:

a haptic presentation unit for generating a physical quantity comprising at least one of a vibration, a torque and a force to present a sensory quantity to a human body to be perceived by said human body, said sensory quantity comprising at least one of a vibration sensation, a torque sensation and a force sensation; and

a control unit for controlling said physical quantity comprising at least one of said vibration, said torque and said force,

wherein said control unit is operable to control said physical quantity based on a haptic sensory characteristic of a human body, wherein said haptic sensory characteristic represents a relationship between said physical quantity to be applied to a human body and said sensory quantity to be perceived by a human body.

27. (New) The haptic information presentation system according to claim 26,

wherein:

said control unit controls said haptic presentation unit utilizing a plurality of operation points on a graph representing the relationship between said physical quantity to be applied to a human body and said sensory quantity to be perceived by a human body,

said haptic presentation unit generates a plurality of physical quantities corresponding to said plurality of operation points to present a predetermined sensory quantity to a human body.

28. (New) The haptic information presentation system according to claim 26, wherein;

said control unit controls said haptic presentation unit utilizing a nonlinearity of the relationship between said physical quantity to be applied to a human body and said sensory quantity to be perceived by a human body,

said haptic presentation unit generates a plurality of physical quantities so that the integral of said physical quantities is zero in a physical cycle to present a predetermined sensory quantity to a human body in the physical cycle.

29. (New) The haptic information presentation system according to claim 26, wherein;

said control unit controls said haptic presentation unit utilizing a hysteresis of the relationship between said physical quantity to be applied to a human body and said sensory quantity to be perceived by a human body,

said haptic presentation unit generates a plurality of physical quantities so that the integral of said physical quantities is zero in a physical cycle to present a predetermined sensory quantity to a human body in the physical cycle.

30. (New) The haptic information presentation system according to claim 26, wherein;

said control unit controls said haptic presentation unit utilizing a masking effect of the relationship between said physical quantity to be applied to a human body and said

sensory quantity to be perceived by a human body,

said haptic presentation unit generates a physical quantity and a masking vibration so that said sensory quantity due to said physical quantity decreases by said masking vibration thereby to present a predetermined sensory quantity to a human body.

31. (New) The haptic information presentation system according to claim 26, wherein;

said control unit controls said haptic presentation unit utilizing a phenomenon that the relationship between said physical quantity to be applied to a human body and said sensory quantity to be perceived by a human body is changed according to at least one of muscle tensile state, physical state, physiological state and psychological state,

said haptic presentation unit generates a physical quantity according to at least one of muscle tensile state, physical state, physiological state and psychological state so that said sensory quantity to be perceived by a human body is changed thereby to present a predetermined sensory quantity to a human body.

32. (New) The haptic information presentation system according to claim 26, wherein;

said haptic presentation unit has two eccentric rotators; and

said control unit is operable to independently change a frequency and an intensity of at least one of a vibration sensation and a torque sensation by controlling rotation directions, a phase relation and rotation speeds of said two eccentric rotators.

33. (New) The haptic information presentation system according to claim 26, wherein;

said haptic presentation unit has two eccentric rotators; and

said control unit is operable to independently change a frequency and an intensity of a force sensation by inverting rotation directions with each other in said two eccentric rotators.

34. (New) The haptic information presentation system according to claim 26, wherein;

said haptic presentation unit has an eccentric rotator array including a plurality of eccentric rotator units arranged in sheet shape, each of said eccentric rotator units including at least one of a single eccentric rotator, a twin eccentric rotator including a pair of eccentric rotators, two twin eccentric rotators including two pairs of eccentric rotators arranged two-dimensionally, and three twin eccentric rotators including three pairs of eccentric rotators arranged three-dimensionally.

35. (New) The haptic information presentation system according to claim 34, wherein;

the arrangement of said eccentric rotator units in said eccentric rotator array can be shaped to a human body.

36. (New) The haptic information presentation system according to claim 35, wherein setting the control mode of said eccentric rotator array causes the presentation of one or more of a vibration, a force, a shear force, a torque, a resultant torque to twist a palm or a finger or another whole presentation object, a shape feeling of a three-dimensional object caused by presentation of a three-dimensional resisting force, an elastic feeling, a tactile sensation, a feeling in which a force is transmitted on a palm or a finger or another presentation object, a feeling in which a material rolls on a palm or a finger or another presentation object, a feeling in which a force, a vibration or a torque passes through a palm or a finger or another presentation object, and a texture of a surface of a virtual object.

37. (New) The haptic information presentation system according to claim 26, wherein;

said haptic presentation unit has one or more rotators each rotating around its axis, for presenting at least one of said vibration sensation, said torque sensation and said force sensation to said human body by a torque which is generated due to a temporal change of the resultant angular momentum vector of the angular momenta of each rotator; and

said control unit is operable to control a temporal change of a resultant angular momentum vector by controlling the rotations of each rotator individually,

wherein said control unit is operable to change the resultant angular momentum vector abruptly when the resultant angular momentum vector is in a vicinity of zero, to suppress a precession torque due to the rotation of a user holding said haptic presentation unit.

38. (New) The haptic information presentation system according to claim 26, wherein said haptic presentation unit has a shape mountable on portable communication equipment or mobile electronic equipment.

39. (New) The haptic information presentation system according to claim 26, wherein;

said haptic presentation unit has a housing, at least an eccentric rotator rotatably mounted in said housing, and a rotation unit for rotating said eccentric rotator and which rotates together with said eccentric rotator; and

said control unit is operable to control a rotation state of said rotation unit included in said haptic presentation unit.

40. (New) The haptic information presentation system according to claim 26, wherein;

said haptic presentation unit includes a fin which rotates together with said eccentric rotator, and a fluid surrounding said fin.

41. (New) The haptic information presentation system according to claim 40, wherein

said fluid is air, and

said housing has a hole communicating with an outside medium.

42. (New) The haptic information presentation system according to claim 26, further comprising an input unit to input external information to said control unit,

wherein said control unit is operable to control a rotation state of each of said eccentric rotators included in said haptic presentation unit in accordance with the external information inputted from said input unit.

43. (New) A haptic information presentation system according to claim 42, wherein;

said haptic presentation unit includes said input unit and said control unit, and
said haptic presentation unit itself is said haptic information presentation system.

44. (New) A haptic information presentation system according to claim 26, wherein;

said haptic presentation unit includes piezoelectric elements, and
said control unit is operable to control a voltage of each of said piezoelectric elements included in said haptic presentation unit.

45. (New) A haptic information presentation system according to claim 26, wherein;

said haptic presentation unit includes magnets, and
said control unit is operable to control a voltage of each of said magnets included in said haptic presentation unit.

46. (New) A haptic information presentation system according to claim 26, wherein;

said haptic presentation unit includes two eccentric rotators, wherein mass points of said two eccentric rotators rotate around a same rotation axis on a same plane.